

Lewis dot diagrams and **BONDING!!!**

8th grade physical science

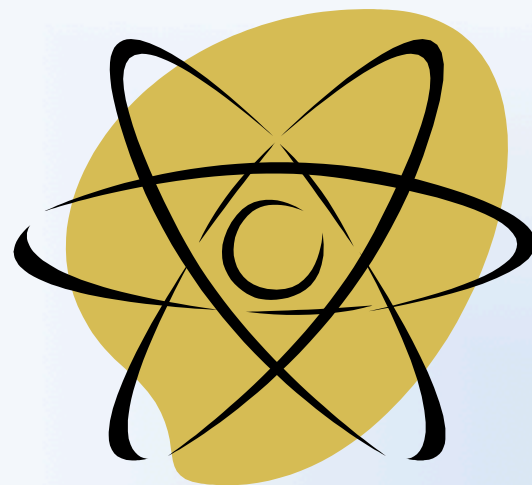
1. A. A little review!

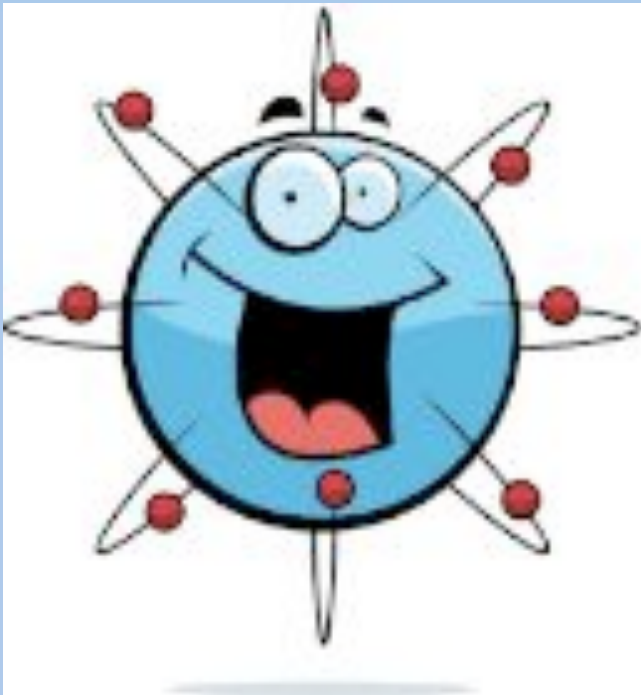
An atom that gains one or more electrons will have a **NEGATIVE** charge.

An atom that loses one or more electrons will have a **POSITIVE** charge.

B. NEW INFORMATION:

An atom that gains or loses one or more electrons is called an **ION**.





All atoms want to be happy, the key to their happiness is a full outer electron orbital, or valance shell.

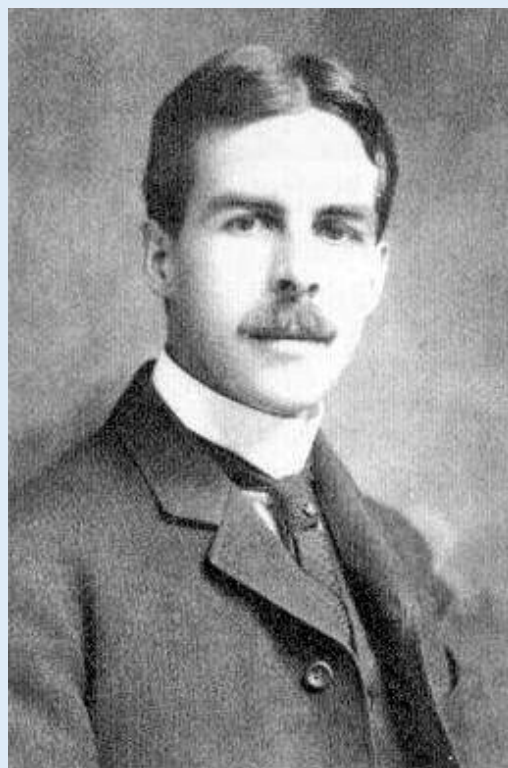
Elements will *gain, lose or share electrons* in order to reach the same number of electrons as the nearest noble gas... this is known as the Octet Rule

Some atoms have too few valence electrons to ever obtain an octet.

Helium and hydrogen have too few valence electrons to ever obtain a full octet.

Helium is the nearest noble gas to them, how many electrons will these elements try to achieve in their valance shell?

2. Lewis Dot Structures



Gilbert Newton Lewis

Lewis Dot Structures

For atoms---

1. Figure out how many valence electrons an atom has.
2. Draw the electrons as dots one at a time around the atoms symbol in a clockwise fashion starting on the top.
3. After one electron is on each side, double them up until you run out of electrons.
4. IE --- Erase the inside layers of a Bohr model and draw only the outermost shell – use dots to represent the electrons!

EXAMPLES

1. Na Cl

Formula:

.... Notice anything about these outer electrons????

3. What is an ionic bond?

Atoms will transfer one or more **ELECTRONS** to another to form the bond.

Each atom is left with a **COMPLETE** outer shell and is now a charged particle.

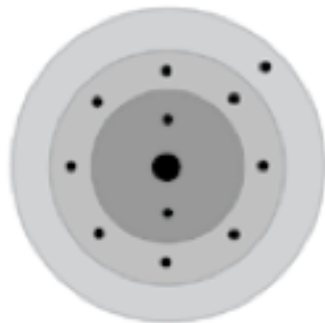
A positive ion is called a **CATION** and a negative ion is called an **ANION**.

“Cat-Eye-On”

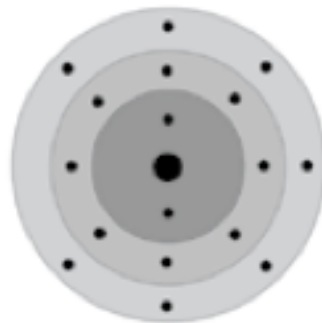
“An-Eye-On”

An ionic bond forms between a **METAL** ion with a positive charge and a **NONMETAL** ion with a negative charge.

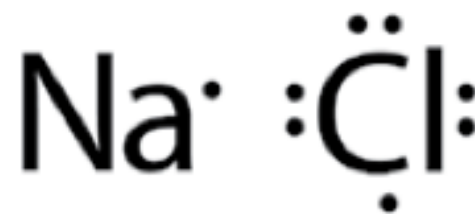
They both have what the other needs..... Therefore they will form an ionic bond!!!



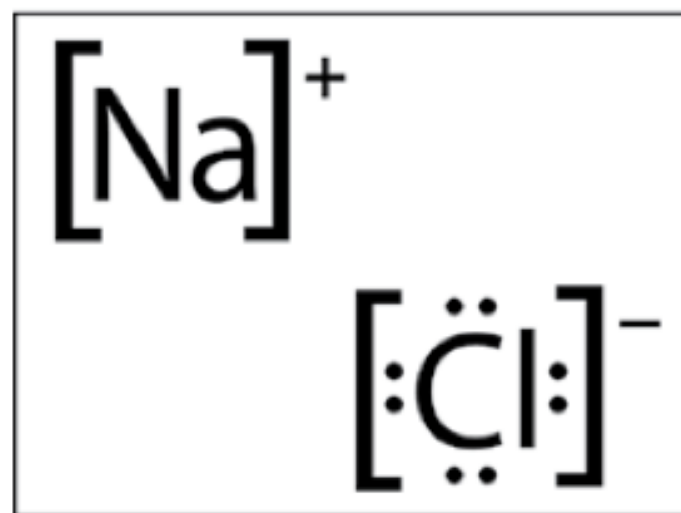
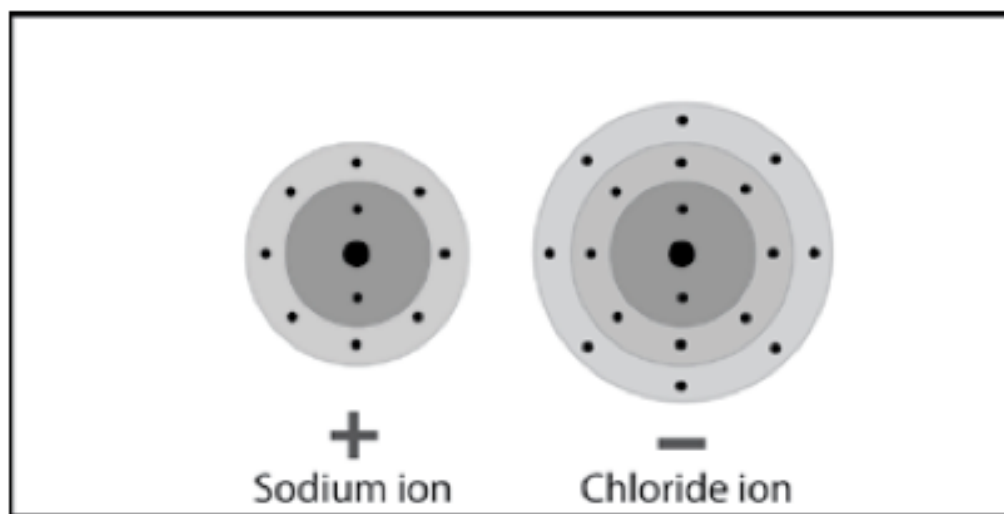
Sodium



Chlorine

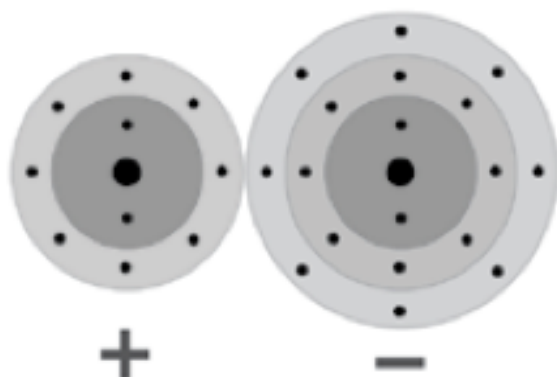


Atoms give or take electrons until their outer most orbital is full!
When they give or take electrons, then they gain a charge.
Show the new Lewis dot diagram for the ion form

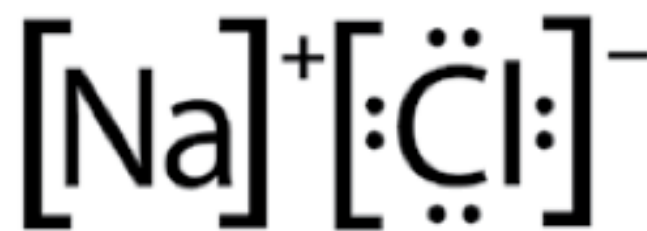


The ions bond together because they carry opposite charges and...

OPPOSITES ATTRACT!!!



Sodium chloride (NaCl)



Ionic Bond Practice

Draw the Lewis Structures for the Potassium(K) ion and the Bromine (Br) ion

Draw arrows showing how electrons are donated and accepted

K

Br

Chemical Formula =

Ionic Bond Practice

Draw the Lewis Structures for the lithium (Li) ion and the Oxygen (O) ion

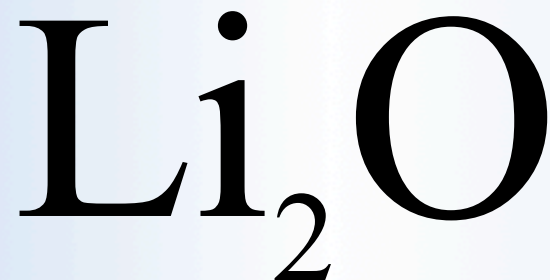
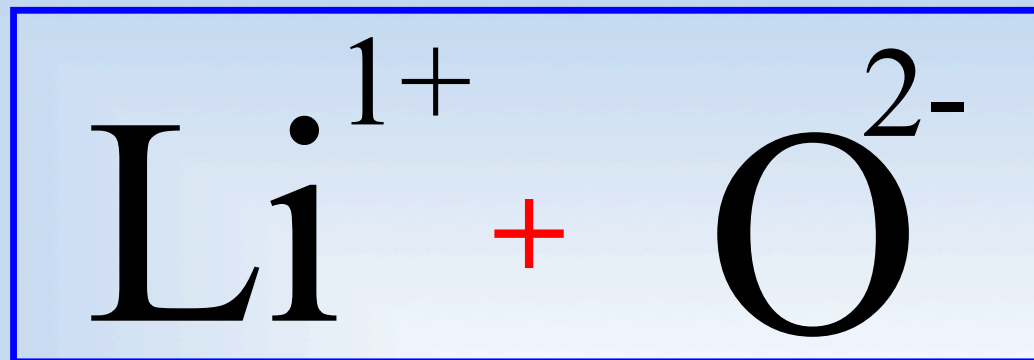
Li

O

Chemical Formula =

4.

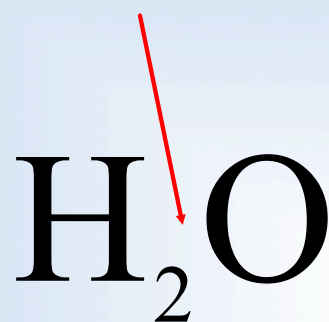
Ion Criss-Cross



Ion Criss-Cross Practice



4a. When writing a chemical formula,
subscripts show the number of atoms present
of a certain element in molecule or compound



of H=

of O=



of Li=

of OH=

4b. A polyatomic ion is: a group of atoms that act like an ion

To write the formulas if there is more than one of these groups one must use **PARENTHESES**.

Ex: Al and NO₃

5. Naming ionic compounds

- Metal (+ ion) comes 1st
- Non metals come 2nd - names end in -ide.
 - Example: sodium chloride
- Do not capitalized unless starting a sentence

Give formula & name: Ca + I, O + Mg, Na + S



= $\text{Ca}^2\text{I}^1 = \text{CaI}_2 = \text{calcium iodide}$
= $\text{Mg}^2\text{O}^2 = \text{MgO} = \text{magnesium oxide}$
= $\text{Na}^1\text{S}^2 = \text{Na}_2\text{S} = \text{sodium sulfide}$

5a. Rules for Transition Metals

- Many transition metals have more than one oxidation number. Indicate the particular oxidation by using parenthesis
- Ex. Fe_2O_3 vs. FeO
- iron (III) oxide vs. iron (II) oxide

5b. Compounds containing polyatomic ions

- $\text{Ba}_3(\text{PO}_4)_2$ = barium phosphate
- Naming compounds with polyatomic ions is similar to naming other ionic compounds
- You should note that compounds with polyatomic ions have names ending in -ate or -ite not -ide
- Name: $\text{Ca}(\text{OH})_2$, CuSO_4 , NH_4NO_3 , $\text{Co}_2(\text{CO}_3)_3$

Compounds containing polyatomic ions

$\text{Ca}(\text{OH})_2$ - calcium hydroxide

CuSO_4 - copper(II) sulfate

NH_4NO_3 - ammonium nitrate

$\text{Co}_2(\text{CO}_3)_3$ - cobalt(III) carbonate

Write the formula for and name the following compounds:

Hydrogen & Chlorine

Calcium & Bromine

Beryllium & Fluorine

Write the formula for the following compounds:

calcium carbonate

sodium hydroxide

sodium sulfite

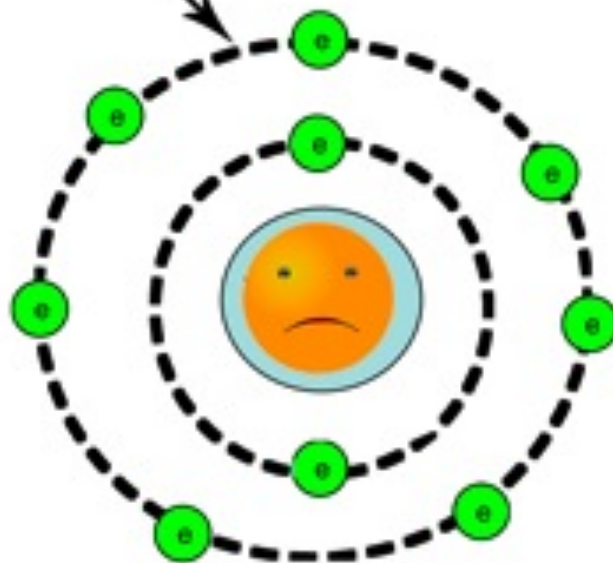
6. What is a covalent bond?

Atoms **SHARE** one or more electrons with each other to form the bond.

Each atom is left with a **COMPLETE** outer shell.

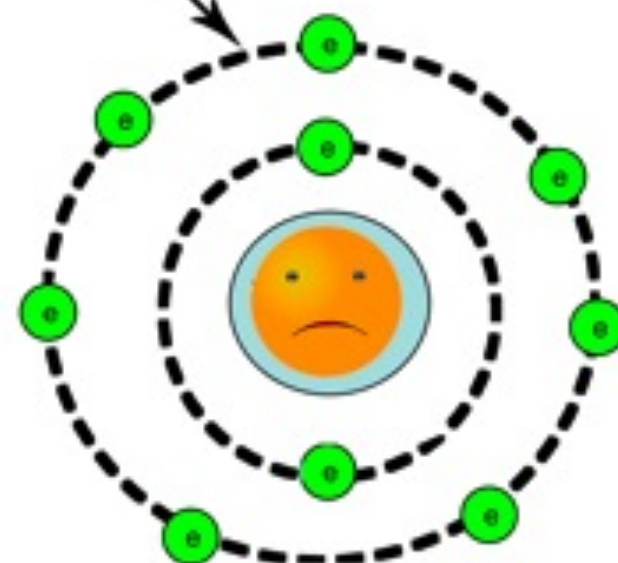
A covalent bond forms between two **NONMETALS** .

Only 7 electrons
in the valence shell



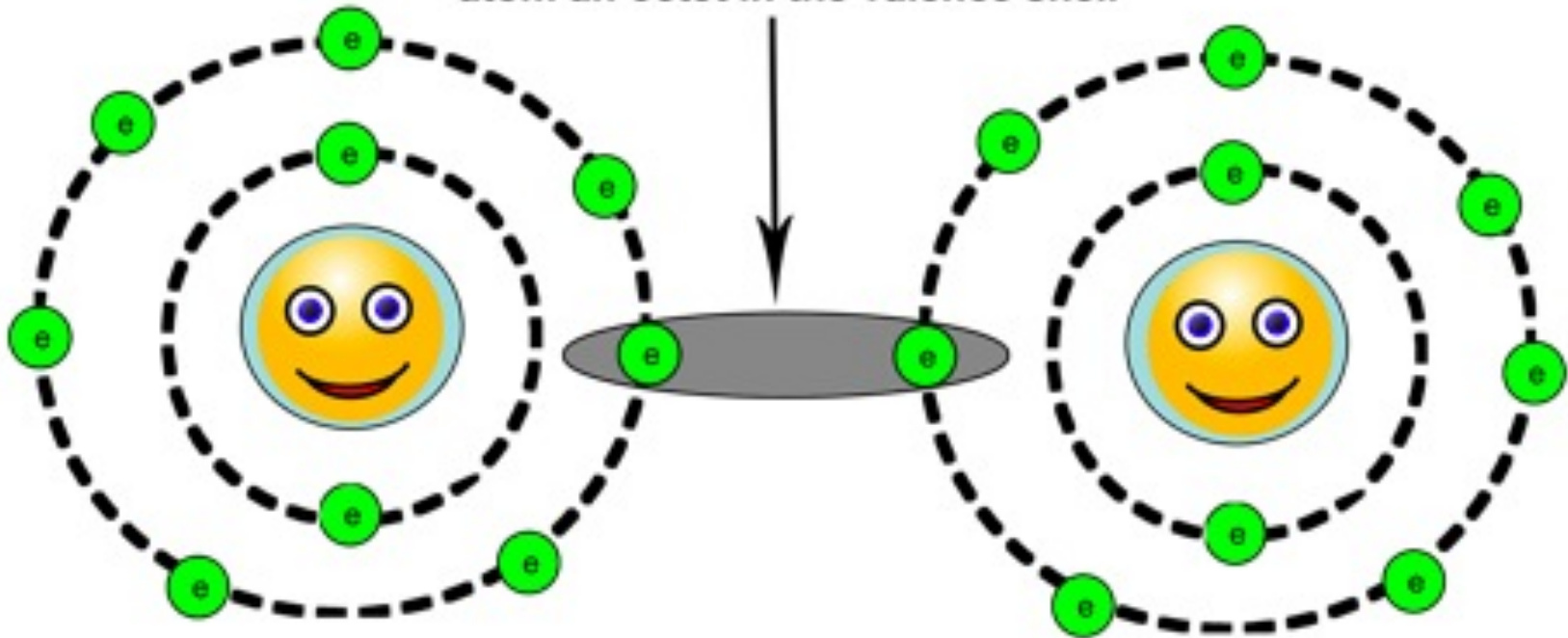
Unhappy fluorine atom

Only 7 electrons
in the valence shell



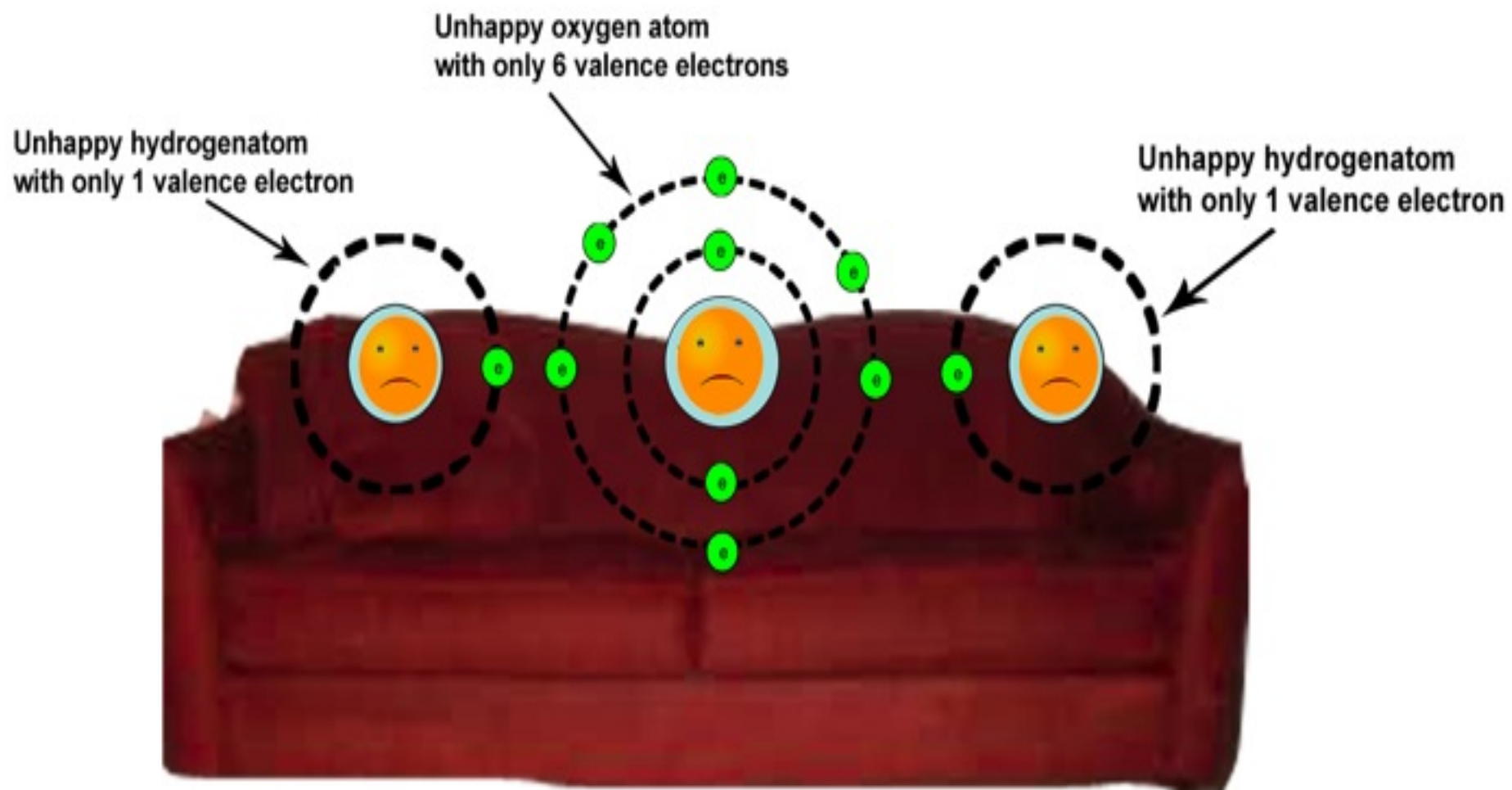
Unhappy fluorine atom

Two valence electrons are shared. This gives each Fluorine atom an octet in the valence shell

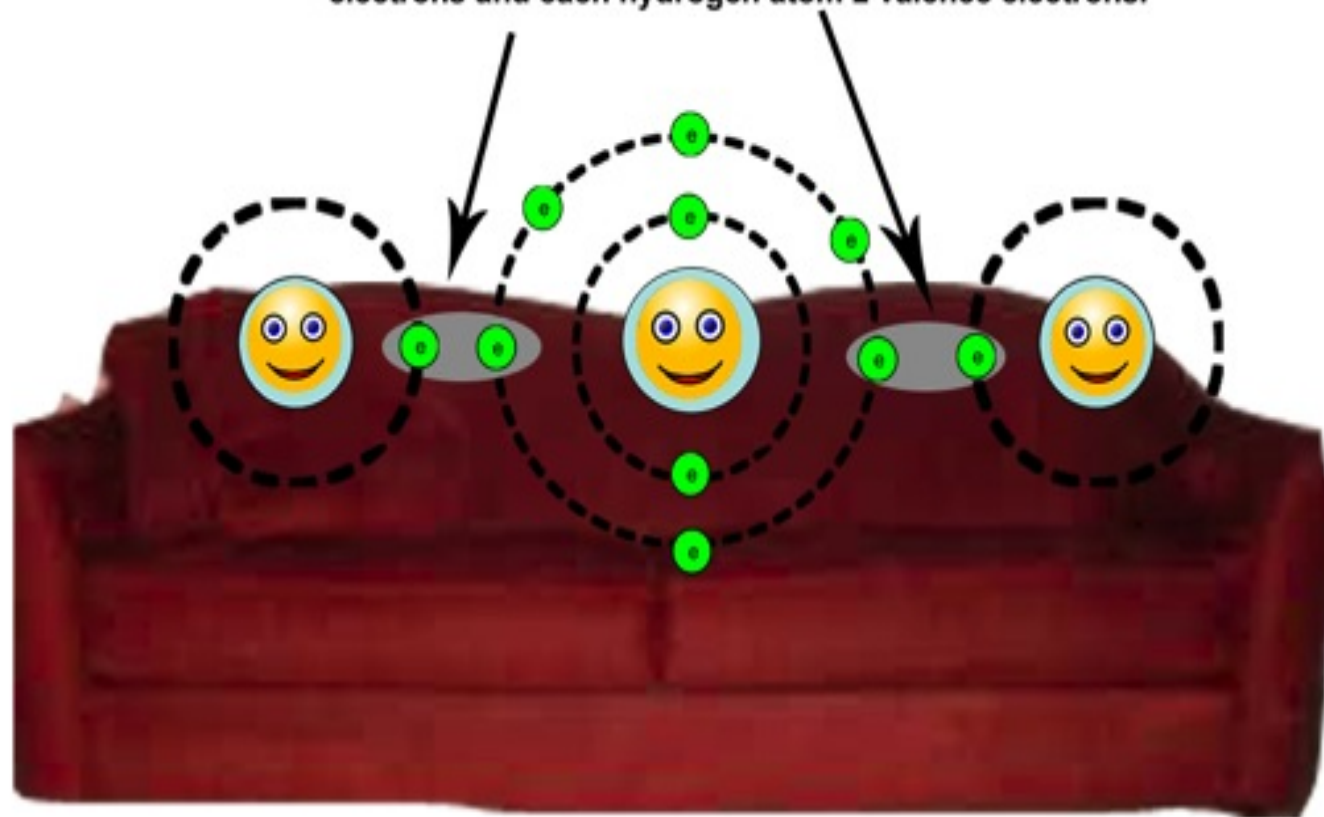


Happy fluorine atom

Happy fluorine atom



Electrons are shared giving oxygen 8 valence electrons and each hydrogen atom 2 valence electrons.



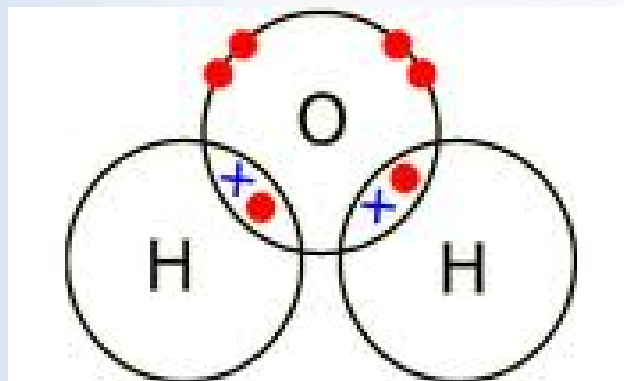
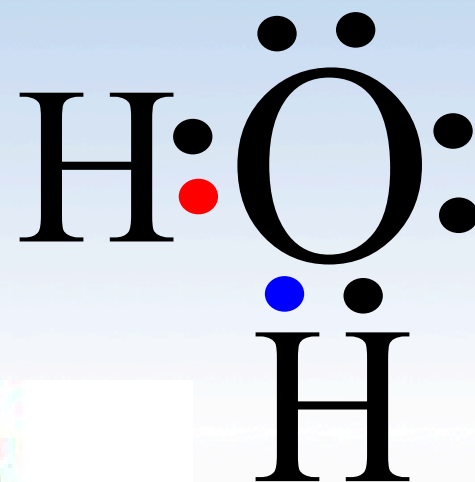
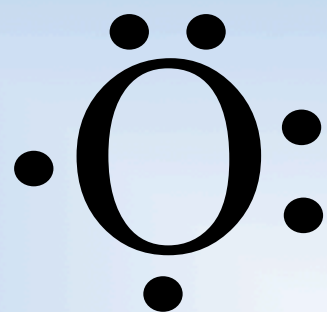
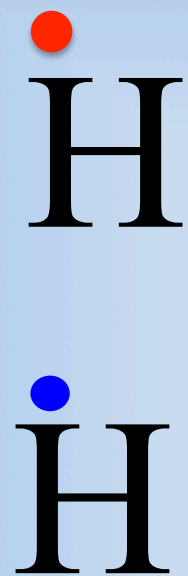
All 3 atoms are happy !

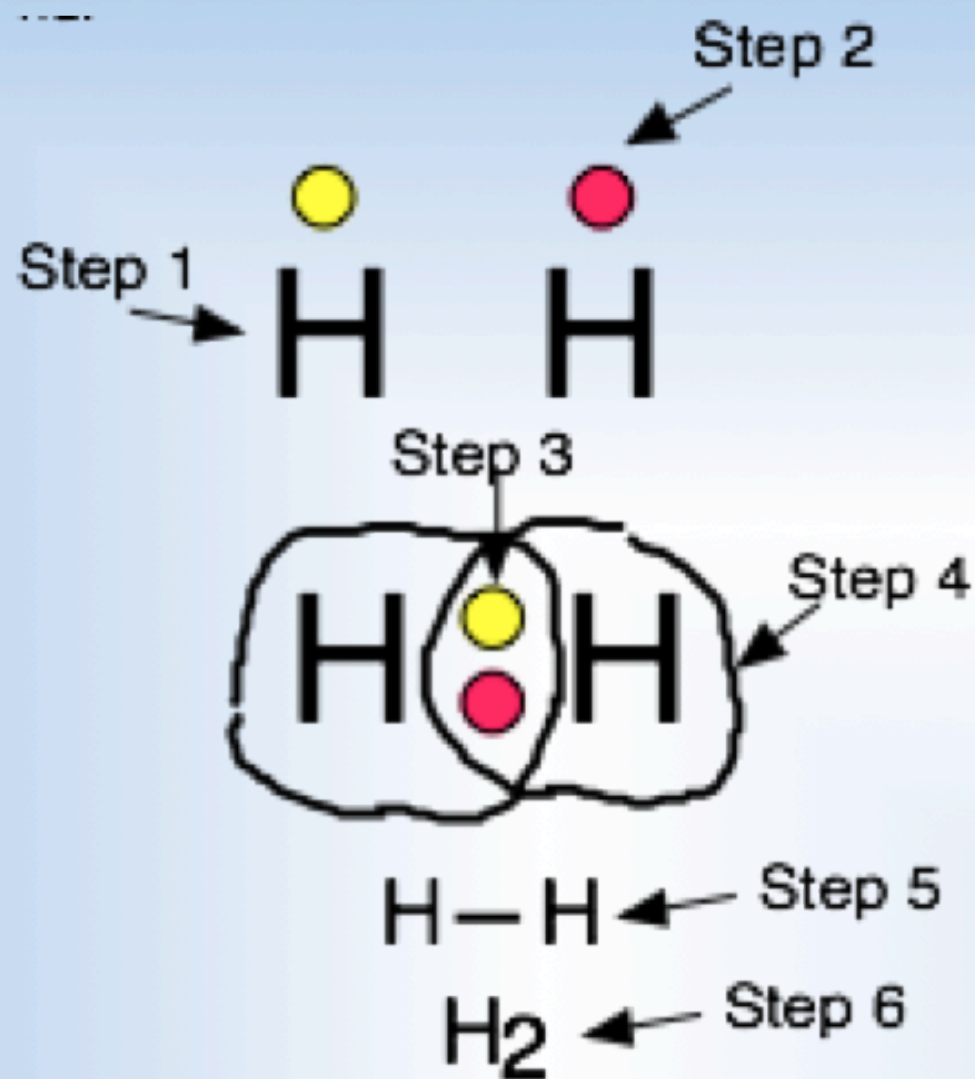
Try this:

H

O

H





Use Lewis dot diagrams to draw the following covalent bonds:

Example1: Chlorine + Chlorine

Example2: Oxygen + Oxygen

Example3: Carbon + 2 Oxygen

Example4: Carbon + 4 Hydrogen

F

F

0

0

N

N

7. Bond Characteristics:

Ionic compounds

vs

Covalent compounds

1. Hard
2. Brittle
3. High Melting Point
4. Only conduct electricity when melted or dissolved
5. Found as solids at room temperature

1. Solid, Liquid or gas
2. Low melting point / boiling point
3. Flammable
4. Do not conduct electricity
5. Do not dissolve in water

